WHAT IS CLAIMED IS:

1. A positioning apparatus comprising:

first measurement means for measuring a position/inclination of a moving part having an optical element while being kept from contact with said moving part; and

driving means capable of driving said moving part in directions of six axes with respect to a fixed part while being kept from contact with said moving part, based on the result of measurement by said first measurement means.

2. The apparatus according to claim 1, wherein said driving means comprises at least six pairs of micro adjustment mechanisms capable of being controlled independently.

3. The apparatus according to claim 1, wherein said driving means comprises a first magnetic block in at least one of said fixed part and said moving part, and a coil in the other.

4. The apparatus according to claim 3, wherein said driving means comprises a first magnetic block in said moving part and a coil in said fixed part.

5. The apparatus according to claim 1, wherein

said driving means comprises a first magnetic block in at least one of said fixed part and said moving part, and an electromagnet in the other.

6. The apparatus according to claim 5, wherein said driving means comprises a first magnetic block in said moving part and an electromagnet in said fixed part.

7. The apparatus according to claim 3, wherein said first magnetic block is a permanent magnet.

8. The apparatus according to claim 1, wherein said first measurement means comprises at least one of a laser interferometer, an encoder, an eddy current sensor and an electric capacity sensor.

9. The apparatus according to claim 1, comprising support means for adding a force to said moving part in an antigravity direction.

10. The apparatus according to claim 9, wherein said support means adds a force to said moving part while being kept from constant with said moving part.

11. The apparatus according to claim 9, wherein said support means comprises an elastic member

coupling said fixed part with said moving part.

12. The apparatus according to claim 9, wherein said support means adds a force substantially equal to the gravity of said moving part to said moving part in an antigravity direction.

13. The apparatus according to claim 1, comprising any one of a bellow, a repulsive magnet, a suction magnet and a spring.

14. The apparatus according to claim 1, wherein said first measurement means is fixed to said fixed part.

15. The apparatus according to claim 1, wherein said moving part is said optical element, and the optical element comprises a target for use in said first measurement means.

16. The apparatus according to claim 1, wherein said optical element is a reflection member.

17. An exposure apparatus comprising the positioning mechanism according to any one of embodiments 1 to 16, wherein said optical element is driven by said positioning apparatus.

18. The apparatus according to claim 17, comprising:

an optical system including said optical element, guiding light emitted from a light source to a mask, and guiding light passing through the mask to a body to be exposed;

a structure frame supporting the optical system and said fixed part; and

second measurement means for measuring a position and/or inclination of said fixed part with respect to said structure,

wherein said driving means drives said optical element based on the results of measurement by said first measurement means and said second measurement means.

19. The apparatus according to claim 18, comprising third means for measuring a position and/or inclination of said structure frame with respect to a basic structure that is different from said structure frame, wherein said driving means drives said optical element based on the results of measurement by said first measurement means, said second measurement means and said third measurement means.

20. The apparatus according to claim 17,

comprising:

an optical system including said optical element, guiding light emitted from a light source to a mask, and guiding light passing through the mask to a body to be exposed;

a structure frame supporting the optical system and said fixed part; and

fourth measurement means for measuring a position and/or inclination of said fixed part with respect to a basic structure that is different from said structure frame,

wherein said driving means drives said optical element based on the results of measurement by said first measurement means and said fourth measurement means.

21. The apparatus according to claim 17, comprising wave aberration measurement means for measuring a wave aberration of said optical system, wherein said measurement means is calibrated by the wave aberration measurement means.

22. The apparatus according to claim 17, wherein the inside of said optical system is kept under vacuum.

23. The apparatus according to claim 17,

wherein the wavelength of light passing through said optical system is 13 to 14 nm.

24. The apparatus according to claim 17, comprising cooling means for cooling both said optical element and said driving means by radiation.

25. A method for producing a device; comprising:

an exposure step of exposing a body to be exposed using the exposure apparatus of claim 17; and

a developing step of developing said exposed body.

26. A positioning apparatus comprising:

a first moving part including an optical element;

a first fixed part;

first driving means for driving said first moving part with respect to said first fixed part;

first measurement means for measuring a position of said first moving part with respect to said first fixed part;

second measurement means for measuring a displacement of said first moving part with respect to a basic structure; and

a first compensator controlling said first

driving means based on the result of measurement by said second measurement means,

wherein said optical element is positioned using said first driving means, said second measurement means and said first compensator, based on the result of measurement by said first measurement means.

27. The apparatus according to claim 26, comprising wave aberration measurement means for measuring a wave aberration of an optical system including said optical element, wherein said optical element is positioned based on the result of measurement by said wave aberration measurement means.

28. The apparatus according to claim 27, wherein said first driving means, said second measurement means and said first compensator position said optical element based on the result of measurement by said first measurement means, and then position said optical element based on the result of measurement by said wave aberration measurement means.

29. The apparatus according to claim 26, wherein said first measurement means comprises an electric capacity sensor and/or an eddy current sensor and/or a differential trans-displacement

sensor and/or laser interferometer.

30. A positioning apparatus comprising:

a first moving part including a first optical element;

a first fixed part;

first driving means for driving said first moving part with respect to said first fixed part;

a second moving part including a second optical element;

a second fixed part;

second driving means for driving said second moving part with respect to said second fixed part;

third measurement means for measuring a relative displacement between said first moving part and said second moving part;

a first compensator controlling said first driving means based on information of measurement by said third measurement means; and

a second compensator controlling said second driving means based on information of measurement by said third measurement means,

wherein said first optical element and said second optical element are positioned using said first compensator and said second compensator.

31. The apparatus according to claim 30,

comprising wave aberration measurement means for measuring a wave aberration of an optical system including said first optical element and said second optical element, wherein said first optical system and said second optical system are positioned based on the result of measurement of said wave aberration measurement means.

32. The apparatus according to claim 30, wherein said third measurement means comprises:

fourth measurement means for measuring relative positions of said first moving part and said second moving part with respect to a first direction at three or more locations;

fifth measurement means for measuring relative positions of said first moving part and said second moving part with respect to a second direction perpendicular to said first direction at two or more locations; and

sixth measurement means for measuring relative positions of said first moving part and said second moving part with respect to a third direction perpendicular to both said first direction and said second direction.

33. The apparatus according to claim 32, wherein said first direction is almost identical to

the direction of the optical axis of said optical element.

34. The apparatus according to claim 32, wherein said fourth measurement means and said fifth measurement means comprise:

a first mirror fixed on said first moving part,

a polarization beam splitter fixed on said second moving part;

a second mirror fixed on said second moving part;

1/4 λ plate placed between said polarization beam splitter and said first mirror and between said polarization beam splitter and said second mirror;

a laser light source and a detector provided on almost the opposite side of said first mirror with respect to said polarization beam splitter; and

a corner cube prism provided on almost the opposite side of said second mirror with respect to the polarization beam splitter.

35. The apparatus according to claim 32, wherein said fourth measurement means and said fifth measurement means comprise:

a bar mirror fixed on a basic structure;

a first polarization beam splitter fixed on the first moving part;

a first mirror fixed on the first moving part 1;

1/4 λ plate provided between the first polarization beam splitter, and the first mirror and the bar mirror;

a first laser light source and a first detector provided on almost the opposite side of the first mirror with respect to the first polarization beam splitter;

a first corner cube prism provided on almost the opposite side of the bar mirror with respect to the first polarization beam splitter;

a second polarization beam splitter fixed on the second moving part;

a second mirror fixed on the second moving part;

1/4 λ plate provided between the second polarization beam splitter, and the second mirror and the bar mirror;

a second laser light source and a second detector provided on almost the opposite side of the second mirror with respect to the second polarization beam splitter; and

a second corner cube prism provided on almost the opposite side of the bar mirror with respect to the second reflection beam splitter.

36. The apparatus according to claim 32, wherein said fourth measurement means and said fifth measurement means comprise:

a bar mirror fixed on the basic structure;

a first mirror fixed on the first moving part;

a polarization beam splitter fixed on the second moving part;

1/4 λ plate provided between the deflection splitter, and the first mirror and the bar mirror;

a laser light source provided on almost the opposite side of the first mirror with respect to the polarization beam splitter; and

a detector provided on almost the opposite side of the bar mirror with respect to the polarization beam splitter.

37. The apparatus according to claim 32, wherein said fourth measurement means and said fifth measurement means comprise:

a prism fixed on the first moving part;

a polarization beam splitter fixed on the second moving part;

a mirror fixed on the moving part 2;

an inclination mirror fixed on the moving part 2;

a 1/4 λ plate provided between the polarization beam splitter and the mirror;

a 1/4 λ plate provided between the prism and the inclination mirror;

a detector provided on almost the opposite side of the mirror with respect to the polarization beam splitter; and

a laser light source provided on almost the opposite side of the prism with respect to the reflection beam splitter.

38. The apparatus according to claim 26, wherein said second measurement means comprises any one of a laser interferometer, an encoder, an electric capacity sensor, an eddy current sensor and a differential trans-displacement sensor and/or laser interferometer.

39. The apparatus according to claim 30, wherein said third measurement sensor comprises any one of an encoder, an electric capacity sensor, an eddy current sensor and a differential trans-displacement sensor and/or laser interferometer.

40. The apparatus according to claim 26, wherein at least one of said first driving means and said second driving means use a six axis micro adjustment mechanism using a linear motor.

41. The apparatus according to claim 26, wherein at least one of said first driving means and said second driving means use a six axis micro adjustment mechanism using an electromagnet actuator.

42. The apparatus according to claim 26, wherein at least one of said first driving means and said second driving means use a six axis micro adjustment mechanism using a piezoelectric element.

43. The apparatus according to claim 26, comprising cooling means cooling said optical element, wherein the cooling means is provided in said first fixed part and/or said second fixed part of said optical element positioning apparatus.

44. The apparatus according to claim 43, wherein said cooling means comprises a Peltier element.

45. The apparatus according to claim 26, comprising a vacuum bulkhead between said first moving part and said first fixed part and/or said second moving part and said second fixed part.

46. The apparatus according to claim 45, wherein a space on the first moving part side of said

vacuum bulkhead and/or a space on the second moving side of said vacuum bulkhead are kept under high vacuum.

47. The apparatus according to claim 45, wherein any one of electrolytically polished aluminum, electrolytically polished stainless, titanium, ceramics, fluororesin and glass is used for said vacuum bulkhead.

48. The apparatus according to claim 26, comprising a body tube including said first moving part, wherein differential exhaust is used for an opening of the body tube, or purging gas is made to pass into the opening of the body tube.

49. The apparatus according to claim 48, wherein said purging gas is helium.

50. The apparatus according to claim 26, comprising a body tube including said first moving part, wherein a filter is provided at an opening of the body tube.

51. The apparatus according to claim 50, wherein any one of polypropylene, zirconium, boron, silicon, silicon nitride and beryllium is used for

said filter.

52. An exposure apparatus comprising the positioning apparatus according to claim 26, wherein said optical element is driven by said positioning apparatus.

53. A method for producing a device, comprising:

an exposure step of exposing a body to be exposed using the exposure apparatus according to claim 52; and

a developing step of developing said exposed step.

54. An exposure apparatus comprising the positioning apparatus according to claim 30, wherein said optical element is driven by said positioning apparatus.

55. A method for producing a device, comprising:

an exposure step of exposing a body to be exposed using the exposure apparatus according to claim 54; and

a developing step of developing said exposed step.